



Consultant Services Bulletin

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Indiana Manual on Uniform Traffic Control Devices

The Indiana Department of Transportation has adopted a new Indiana Manual on Uniform Traffic Control Devices. This manual became effective on September 28, 2003. This manual was also approved by the FHWA for use on federally funded contracts. The manual may be found at www.in.gov/dot/div/contracts/design/mutcd/mutcd.html.

Obstruction Free Zone

The Obstruction Free Zone on 3R projects is important. Violations such as trees, telephone poles, signs and other items spelled out in Chapter 55-5.03(01) need to be addressed as a Level 2 Design Exception.

If the Obstruction Free Zone is violated, rationale for non-conformance and written concurrence from local agencies are to be documented and placed in the file.

Riprap in the Clear Zone

Do not use revetment riprap within the clear zone regardless if it is a 4R or 3R project.

This supercedes the guidance given in practice pointer number 18 in Consultant Services Bulletin 00-2, dated October 2000.

Uniform riprap is an acceptable material within the clear zone.

Riprap at Culverts

Do not place revetment riprap around grated box end sections or safety metal end sections. If some measure is needed to prevent erosion at these locations, uniform riprap is acceptable.

Guardrail and Culverts

Item 6 of 49-3.03 (01) is revised to read as follows:

Box or 3-Sided Structures. Consult the table below for acceptable options. The most cost-effective treatment should be considered.

Span	Rise	Options
$\leq 3\text{m}$	All	A*
$> 3\text{m}$	< 1675	A*
$> 3\text{m}$	≥ 1675	B

- A Establish a clear zone for a distance L_R in advance of the structure
- B Install guardrail
- * Install guardrail if it is not cost-effective to provide a clear zone.

Removing sections of a box culvert and attaching metal circular or pipe arch adapters, a short section of metal culvert, and then an INDOT approved grated end section (not an option if the span is greater than 1.5m) is also an option.

Delete item 4 of 55-5.03(02) and insert:

If the point at which the top of culvert (box or 3-sided) protrudes from the slope is within the obstruction free zone, guardrail should typically be provided; otherwise the following table should be used to determine the appropriate treatment.

Span	Rise	Treatment
$\leq 3\text{m}$	All	B-preferred; A-acceptable
$> 3\text{m}$	< 1675	B-preferred; A-acceptable
$> 3\text{m}$	≥ 1675	B*

- A Provide a clear zone with 6:1 slopes or flatter at least a distance L_R in advance and 30m beyond the structure. Taper 10:1 on both sides of the structure to tie back in.
- B Install guardrail.
- * Use method A if guardrail is impractical due to the close proximity of public road approaches or drives. Driveway grades should be designed to be compatible with clear zone slopes. Driveway sideslopes should be 10:1.

Public Road Approaches

If a Type C or Type D public road approach is required the standard drawings are satisfactory.

If a Type A or Type B public road approach is required **and** if there are less than 50 trucks per day during the design year on the minor road, the standard drawings are satisfactory; however if there are 50 or more trucks per day during the design year on the minor road, the designer should use the procedure specified in section 46-2 for the design of the public road approach.

Temporary Right of Way for Driveway Construction

Temporary Right of Way is not always warranted for driveway construction. If no permanent Right of Way is required from a property owner, try to avoid taking temporary Right of Way from that parcel. This article is an effort to reduce the number of parcels on a project.

Several reasons to use Temporary Right of Way are as follows:

- 1) The proposed grade and/or the vertical curve to construct the drive tie-in goes beyond the permanent R/W. Generally drives should not exceed vertical tie-in grades as shown on the standard sheets.
- 2) If the proposed drive is wider than the existing drive, it is preferred to place the tapers beyond the permanent R/W as shown on the standard sheets.
- 3) Revising the drainage causes grading work beyond the permanent R/W.

Several reasons not to use Temporary Right of Way are as follows:

- 1) Do not use Temporary R/W where paving is not necessary outside of the permanent R/W. The contractor or project engineer will contact the property owner regarding working room at the R/W line.
- 2) Do not use Temporary R/W if the driveway tie-in is short of the permanent R/W line, pave only to the tie-in point, unless you do not have the same material all the way to the permanent R/W line.
- 3) Resurface projects – A three foot wide HMA wedge is usually placed adjacent to the mainline or shoulder pavement. See section 56-4.11(03).

Construction limits are to be shown within the limits of Temporary Right of Way. Do not take excessive Temporary Right of Way outside of the construction limits. A good distance for clearance from the construction limits to the Temporary Right of Way is 5 feet. This distance could vary depending on the individual situation. When setting Temporary Right of Way, look at features that fall within their limits. This would include trees, wells, septic systems, planters, gardens, signs, lamp posts and numerous other items. If these items are not required to be removed, and the Temporary Right of Way cannot be justified to miss the item, a do not disturb note should be placed on the item to be protected.

Modified Drives

A modified drive should be called for on the plans when the drive differs from the standard drawing. Examples of when to call for a modified drive include:

1. the radius is different than shown on the standard drawing,
2. there are “overlapping” drives, or
3. the pavement section is different than shown on the standard drawing.

If you are using a standard drawing that otherwise would not be applicable, make reference to the desired standard drawing in the “remarks” column of the approach table. This drive would be considered a standard (as opposed to a “modified”) drive. See consultant news bulletin 02-1 (page 10, item 14).

Termination of Mainline Pavement Treatment

In Design Memorandum 03-16, INDOT established that the saw cut to be used with transition milling is to be 1 ½ inches (38 mm). See Page 5 of Recurring Special Provision 306-R-463 which is attached to the Design Memorandum. Standard Drawings E 402-TMPT-01 and 402-TMPT-01 show the saw cut, however the metric version erroneously refers to the saw cut as 40 mm deep.

Drainage in Curbed Sections

In chapters 53 and 55 it is stated that the minimum grade in curbed sections is 0.3%. Additional guidance is needed for superelevation transition areas to avoid drainage problems. The following criteria will alleviate such problems:

1. Maintain minimum profile grade of 0.5% through the transition section.
2. Maintain minimum edge of pavement grade of 0.5% through the transition section.

The second criterion is equivalent to the following equations:

$$G \leq -\Delta^* - 0.5$$

$$G \geq -\Delta^* + 0.5$$

$$G \leq \Delta^* - 0.5$$

$$G \geq \Delta^* + 0.5$$

with,

$$\Delta^* = \frac{(wnl) e_d}{L_r}$$

where:

G = profile grade, percent;

Δ^* = effective maximum relative gradient, percent;

L_r = length of superelevation runoff, m;

n_l = number of lanes rotated, lanes;

w = width of one traffic lane, m (typically 3.6 m)

e_d = design superelevation rate, percent.

EXAMPLE

To illustrate the combined use of the 2 criteria, consider the following:

$\Delta^* = 0.65\%$ in the transition section

Hence, the first criterion excludes grades between -0.50% and $+0.50\%$. The second criterion excludes grades between -1.15% and -0.15% (via the first 2 components) and those between $+0.15$ and $+1.15\%$ (via the last 2 components). Therefore the profile grade within the transition must be outside the range of -1.15% to $+1.15\%$ in order to satisfy all of the criteria and provide adequate pavement surface drainage.

See pages 190 and 191 of the 2001 “Green Book”.

Correction of Superelevation Outside Project Limits

Sometimes a project will end on a curve. If the superelevation on the curve is less than or equal to 1% below the required superelevation rate no further action is required. Generally, if the superelevation on the curve is more than 1% below the required superelevation rate, INDOT desires the superelevation to be brought up to current standards.

When the superelevation is brought up to current standards, the criteria in Chapter 56 (Partial 3R Projects) will apply outside the project limits.

Setting Profile Grade on Multilane Highways

When two-lane highways are upgraded to four-lane, divided highways, independent roadway design is frequently used to achieve better geometrics on the newer roadway. The elevations of the two roadways should be approximately equal at at-grade intersections.

Guardrail and Sidewalk

Where guardrail is located along a section of road between the road and sidewalk, it is desirable to locate the sidewalk at least 1.5 m behind the guardrail. If constraints preclude the 1.5 m clearance, a rub rail on the back side of the guardrail posts at rail level should be used to prevent injury to pedestrians. See page 87 of AASHTO's Highway Safety Design and Operations Guide for a view of the rub rail. The designer must include a special detail of this guardrail in the plans until a standard drawing is developed.

Information to be Shown on the Corps Permit Application

The Corps permit application asks for the volume of fill, concrete, and riprap to be placed below the ordinary high water elevation. The volume of concrete to show on the application should include both precast (boxes and 3-sided structures) and cast-in-place concrete.

The Corps also requires the following information for all box culverts, 3-sided structures, and 3 ft. or greater diameter pipes in natural waterways. Please provide the length of the structure, the area impacted in acres and the waterway type (ephemeral, intermittent or perennial) in the permit application.

Bridge Design Data

Currently, the following note is placed on the General Plan sheet:

Designed for HS20-44 loading in accordance with 1996 AASHTO Specifications and subsequent interim AASHTO Specifications.

Beginning with projects on the March 2004 letting please use one of the following notes:

Designed for HS20-44 loading in accordance with 1996 AASHTO Specifications and subsequent interim AASHTO Specifications through _____.
(year)

or

Designed for HS20-44 loading in accordance with the 2002 AASHTO Specifications.

The designer is to design a structure in accordance with the edition and interims of the AASHTO Standard Specifications for Highway Bridges in effect on the date design approval is received. The designer may, at his or her discretion, use subsequent editions and interims.

For the purpose of this matter, interims shall be considered effective on July 1 of the year issued.

Hybrid Girders

Hybrid girders (e.g., Grade HPS 70W flanges and Grade 50W webs or Grade 50 flanges and Grade 36 webs) (e.g., Grade HPS 485W flanges and Grade 345W webs or Grade 345 flanges and Grade 250 webs) are permitted. Hybrid girders shall be designed in accordance with AASHTO's Standard Specifications for Highway Bridges, 17th Edition.

Development Length of Bars in Compression

It is acceptable to use the tension development length for bars in compression (the tension development length is greater than or equal to the compression development length).

Lap Splices of Bars in Compression

It is acceptable to size lap splices of bars in compression as through they are in tension (the lap splice length for tension is greater than or equal to the value for compression; hence, it is conservative).

Pier Design

Based upon LRFD 5.13.3.8 (also 4.4.11.5.4 in the 16th Ed.), the amount of steel across the interface (between the pier stem and the footing) shall not be less than 0.5 percent of the gross area of the supported member, and the number of bars shall not be less than four.

LRFD 5.10.11.4.2 provides in part:

The minimum reinforcement ratio, both horizontally and vertically in any pier shall not be less than 0.0025. The vertical reinforcement ratio shall not be less than the horizontal reinforcement ratio.

The reinforcement spacing, either horizontally or vertically shall not exceed 18 inches (450 mm).

All of the above criteria apply to designs using the 16th or 17th editions.

This guidance supplements that contained in news bulletin 03-1 (page 4).

Ties in Compression Members

Section 8.18.2.3 of the 16th Edition (and also LRFD 5.10.6.3) provide for ties in compression members. Designers should note that the above provisions apply to pier stems, columns, and other compression members.

Ties may be #3 bars (#10 metric) for longitudinal bars up to #10s (#32s metric).

Steel Reinforced Elastomeric Bearing Pads

INDOT has developed standard bearing pads for use with AASHTO prestressed concrete I-beams. During 2002 AASHTO revised the equations for rotation. See 14.6.6.3.5b-1 of the 16th Edition. Until further notice, it is necessary for designers to check (and redesign, if necessary) the pads to be used with AASHTO prestressed concrete I-beams.

Empirical Design of Concrete Decks

In Consultant News Bulletin 01-1, INDOT authorized the use of empirical design of concrete decks. The following information is to supplement and clarify the guidance in that article.

LRFD 9.7.2.4 states “for the purpose of this article, the design depth of the slab shall exclude the loss that is expected to occur as a result of grinding, grooving or wear.” In accordance with LRFD 2.5.2.4, $\frac{1}{2}$ ” is provided “to permit correction of the deck profile by grinding, and to compensate for thickness loss due to abrasion.” Therefore, using LRFD the design depth of an 8” deck is $7\frac{1}{2}$ ”.

The core depth is $4\frac{1}{2}$ ” (8 ”- $2\frac{1}{2}$ ”- 1 ”), which is greater than or equal to 4” (A minimum of 4 inches is required by AASHTO LRFD.).

For an 8” deck the effective length must be 45” – 135”.

The 2001 article requires the coping overhang to be designed using LRFD in accordance with 9.7.2.2. Generally, the Extreme Event II Limit state controls the design of the overhang. In essence, the deck is designed so that the railing fails before the deck so that the deck will not need to be repaired.

**Bridge Replacement Special Provision Checklist
(For Project Lettings after March '04)**

Every bridge replacement project will have the following:

105-C-056 106-C-074 107-C-169

- 100-C-146 Min. wage (Lake, LaPorte, Porter and St. Joseph County) **OR**
- 100-C-147 Min. wage (Elsewhere)
- 104-C-139 Geotechnical Evaluation Report
- 107-R-169 Existing Conditions of Additional R/W, Utilities, etc.
- 109-B-148 Cost Reduction Incentive
- 202-C-175 Demolition/Renovation Notification to IDEM
- 206-B-113 General Bridge Requirements (If Design Approval after 3-01-94)
- 601-R-338 Guardrail Blockouts

Many bridge replacement projects will also require the following:

- 105-R-305 Pipe Structure Pay Items
- 107-B-040 Environmental Restrictions
- 107-C-051 U.S. Army Corps of Engineers Permit
- 200-R-401 Recyclable Spent Foundry Sand Application
- 200-R-402 INDOT Microtox Test Method & Acceptance
- 201-C-052 Clearing R/W (Pay item: Clearing R/W)
- 203-R-360 Embankments constructed of CCBP (Borrow > 3800 m³ or 5000 cys)
- 701-B-132 Pile Driving
- 707-B-013 High Range Water Reducers in Prestressed Beams
- 715-R-361 Pipe Material Abbreviations
- 717-R-152 Alternates to Structural Plate Structures
- 730-B-157 QC/QA Superstructure Concrete
- 808-B-114 "No Passing" Zone Repainting
- 808-T-116 Snowplowable RPM Markers
- 808-T-141 Removal of Snowplowable Raised Pavement Markers
- 913-T-120 Reflective Lens for Snowplowable RPM

Other occasionally recurring bridge related special provisions:

- 101-B-042 Structure Numbers for Pay Items
- 103-C-159 Wage Stipulations (Only on All State Funded Projects)
- 107-R-042a Railroad Information
- 107-R-042b Protection of Railway Interest
- 203-B-025 Marion County Borrow Pits
- 203-R-155 Rock Backfill
- 601-R-016 Construction Zone Energy Absorbing Terminal, CZ
- 601-R-146 Removal of Guardrail (If Guardrail Requested by District)
- 622-R-209 Wildlife Habitat (Do Not Use if Shown on Plans)
- 701-B-068 Bitumen Coating for Piles
- 701-B-078 Oversized Predrilled Pile Holes for Integral End Bent Structures
- 701-B-154 Oversized Predrilled Pile Holes for Reduction of Pile Downdrag

- 703-C-138 Reinforcing Steel (Projects with Hard Metric Rebars)
- 713-B-076 Temporary Pipe (Pay Item: Temp. Pipe and Approaches)
- 714-R-437 Oversize Precast Reinforced Concrete Box Culvert (Span > 12 ft)
- 715-R-342 Pipe Backfill Methods (Pipes Referred to as Groups)
- 723-R-282 Precast Reinforced Concrete 3-Sided Structures **OR**
- 723-R-282 f Precast Reinforced Concrete 3-Sided Flat-Topped Structures
- 724-B-046 Modular Expansion Joints
- 724-B-086 Approved Expansion Joint SS Devices
- 726-B-044 Bearing Assemblies
- 728-B-039 Masonry Coating (Urban Projects)

Road Special Provision Occasionally Recurring in Bridge Projects:

- 203-R-121 Borrow Pit Wetland Enhancement (If Requested by F & W)
- 621-R-398 Capping Cut and Fill Slopes Steeper than 3:1
- 718-R-397 Underdrain Outlet Protectors
- 731-R-202 Mechanically Stabilized Earth Retaining Walls (Proprietary)
- 732-R-433 Bin-Type Retaining Wall
- 801-C-157 Certification of Temporary Traffic Control Devices

For Projects that require "Removal of Buildings" Include:

- 108-L-001 Notice to Proceed With Demolition Work
- 108-L-012 Specialty Pay Items (Pay Item: Asbestos Testing and Removal)

Note: This is only a suggested list of Recurring Special Provisions. It is the Project Manager's responsibility to compile an accurate list.

BRIDGE REPLACEMENT RECURRING PLAN DETAIL CHECKLIST

Every bridge replacement project will have the following:

- 107-B-169d Traffic Control Device Report Form

Many bridge replacement projects will also require the following:

- 701-B-101d Pile Driving and Equipment Data Form
- 718-R-397d Precast Outlet Protector Type 1 or Type 2

Note: This is only a suggested list of Recurring Plan Details. It is the Project Manager's responsibility to compile an accurate list.

Construction Changes

The proper procedure for construction changes is:

1. District notifies the Contracts and Construction Division of a needed construction change to the plans.
2. The Contracts and Construction Division notifies the Design Division of a needed plan change.
3. The Design Division notifies the designer of the needed plan change.
4. The designer (consultants only) requests approval of the Consultant Services Manager, to be compensated for the change. See News Bulletin 97-1 (page 1).
5. The designer prepares plans for the construction change. See 14-1.02(05).

If the designer is contacted directly by the project engineer, project supervisor, or contractor regarding a change to the plans, the designer should request the person to follow the above procedure.

Practice Pointers

1. Threaded rebars included in the diaphragms will not be paid for directly, but are to be included in the cost of other items.
2. All three-sided culverts, oversize box culverts, multiple box culverts, and multiple pipe structures qualify as bridges if their total span length exceeds 20 feet (6.1 meters). A large culvert having an opening width of 20 feet (6.1 m) or less may also qualify as a bridge if the skew causes the span measured along the centerline of the roadway to be more than 20 feet (6.1 m). If either the flat-top or arch alternate for a 3-sided culvert exceeds 20 feet (6.1 m) as described above treat it as a bridge. Please obtain a structure number and Des. No. for each such structure.

This guidance supercedes the information published in consultant news bulletin 01-1 (page 12).

3. Designers are reminded to comply with 8.16.8.4 (16th Ed.) regarding crack control and distribution of flexural reinforcement in concrete members (deck, reinforced concrete slab, pier stem, footing, etc.).
4. Do not place survey monuments for PCs, PIs or PTs on bridges. A benchmark is still to be placed on each bridge.
5. After submission of preliminary right-of-way plans, the designer is responsible for notifying Land Acquisition, in writing, of any proposed change to the right-of-way lines so Land Acquisition can determine whether or how to proceed with its work. This guidance is in addition to that contained in practice pointer #8 of Consultant Newsletter No. 02-1.
6. Reinforcing steel in bridge rail transitions is to be paid in pounds (kilograms). See 706.07.

Level One Design Criteria Checklist

Please note that a new Level One Design Criteria Checklist has been posted to the Designer Forms webpage. www.state.in.us/dot/div/contracts/design/forms.html. Please begin using the new form immediately.

Limited Review Certification

Please note that a new Limited Review Certification form has been posted to the Designer Forms webpage. www.state.in.us/dot/div/contracts/design/forms.html. Please begin using the new form immediately.

Memorandum to Contracts Services Section

Please note that a new Memorandum to Contracts Services Section form has been posted to the Designer Forms webpage. www.state.in.us/dot/div/contracts/design/forms.html. Please begin using the new form immediately.